

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking  
Into Distributed Generation

Rulemaking 99-10-025  
[Filed October 21, 1999]

DISTRIBUTION SYSTEM PLANNING AND OPERATIONS WORKSHOP  
SOLAR DEVELOPMENT COOPERATIVE  
ANSWER TO QUESTIONS



300 kWp BI-PV Rooftop Installed 1984  
Intercultural Center at Georgetown University Washington, DC

I. INTRODUCTION

Pursuant to Administrative Law Judge's Ruling On Distribution System Planning and Operations Workshop to be held December 15, 1999 the Solar Development Cooperative has provided their answer and insight to the questions provided at Attachment A.

Distribution System Planning and Operations Workshop Questions

**OPERATIONAL QUESTIONS:**

1. What changes in operations will the UDCs be required to make to accommodate distributed generation on the end-user side or grid side of the meter?

**ANSWER:** Consumer education is one of the primary requirements to accommodate DG on the end-user side and really is an important issue for grid-side DG. Systems monitoring will continue to play an important role in the deployment and management of DG

DISTRIBUTION SYSTEM PLANNING AND OPERATIONS WORKSHOPS  
SOLAR DEVELOPMENT COOPERATIVE  
ANSWER TO QUESTIONS

---

technology. One of our workshops developed for the American Power Conference in 1998 was entitled ***Building-integrated Photovoltaics for Primary Energy Producers [BI-PV PEP USA]***. The program was developed in response to our research regarding the UDC's knowledge of BI-PV technology.

UDC staff education related to DG is also a primary requirement. While the UDC is another DG consumer, the UDC needs to educate its own staff about DG and its potential for successful and cooperative DG facilitation. UDC must make sure to train call center staff to transfer DG consumer questions the right source. The UDC must have a management structure in place for addressing the unique needs of DG deployment. The three categories of DG deployment must be included in the management matrix to effectively serve consumers. We suggest the following management matrix for UDCs:

1. UDC Staff Education about DG
2. Public Education about DG
3. Finance Workshops For DG Consumers
4. Consumer Owner Manuals and Warranty Enforcement Center
5. Grid Connection of DG
  - a. Up to 10 kilowatt peak [net metering]
  - b. 10 kilowatt peak to 1 Megawatt peak
  - c. 1 to 20 MWp
6. Net Metering
7. DG Technology Monitoring
8. **UDC Use and Deployment of DG**
9. **Manufacturing and Deployment Opportunities In DG**
10. **DG Research and Development Activities and Opportunities**

Our ***Millennium Dome® BI-PV Manufacturing Museum*** demonstrates the new agenda for public participation in decision-making within the energy industry facilitated by combining consumer education with new technology demonstrations

**DISTRIBUTION SYSTEM PLANNING AND OPERATIONS WORKSHOPS  
SOLAR DEVELOPMENT COOPERATIVE  
ANSWER TO QUESTIONS**

---

and renewables technology manufacturing. The UDC could incorporate this type of agenda to manage and facilitate DG into the UDC energy mix. The UDC needs to inform consumers about DG deployment incentives and opportunities within community through ratepayer bills, newsletters and workshops.

2. What level of DG deployment will affect distribution system operations? What is the best measure of deployment level: the number of installed megawatts on a distribution circuit, a percentage of megawatts of installed capacity versus normal load on the circuit, or some other indicator(s)?

**ANSWER:** Every level of DG interconnection could potentially effect distribution system operations. This is why it is vital to assure quality products and service remain the cornerstone of DG deployment. The UDC needs to develop strong working relationships to facilitate consumer and industry cooperation. SDC/Smith has developed a Matrix of DG deployment that assists in categorizing the potential impact of DG on the UDC as well as the potential deployment of DG by the UDC. This Matrix is included herein at Appendix A. The 1-20 MWp systems will have the greatest impact on system planning due to the tremendous contribution of electricity of one system to meet consumer demands. The interconnection standards and liability requirements for these systems will be more significant than those for small DG systems.

3. Will the answer to Question 2 depend upon whether the interconnection voltage is primary, secondary, or subtransmission, and whether the distribution circuit is radial or networked? If yes, please explain.

**DISTRIBUTION SYSTEM PLANNING AND OPERATIONS WORKSHOPS  
SOLAR DEVELOPMENT COOPERATIVE  
ANSWER TO QUESTIONS**

---

4. What changes in distribution system equipment (transformers, voltage regulators, separate feeders, etc.) would be necessary to accommodate DG at various levels of deployment on a given circuit? Please explain.

**ANSWER:** DG may provide the opportunity to reduce transmission lines and transformers in some instances. Depending on the size of DG, unique system planning issues may be required. Where a DG system is installed it might provide an opportunity to assess the condition and character of wiring leading to the facility that could cause potential harmonizing problems for DG electricity coming onto the grid. Such wiring and distribution equipment could be upgraded where needed to better facilitate DG consumers and system management safety. Some areas of the distribution wires system are more worn and vulnerable to problems of new types of load harmonizing than others. These issues need to be clarified and included in consumer education workshops. This will increase consumer awareness and reduce potential system problems and safety hazards.

Consumers need to understand the interconnection issues involved with using a back-up system and the requirements for those consumer systems that are planned for grid down times. It must be understood that these systems need to be set up to entirely disconnect from the grid where the utility system goes down. This might seem like a simple issue to a UDC technician, however a clear explanation with illustrations and diagrams will reduce potential misunderstandings in interconnection of these systems and avoid islanding. Many DG consumers have voiced an interest in the independent backup system. Small DG consumers should not be forced to bear extreme expenses for interconnection.

**DISTRIBUTION SYSTEM PLANNING AND OPERATIONS WORKSHOPS  
SOLAR DEVELOPMENT COOPERATIVE  
ANSWER TO QUESTIONS**

---

**PLANNING QUESTIONS**

1. What are current distribution system planning methods, procedures and criteria used by the UDCs to determine where and when to upgrade or add facilities?

**ANSWER:** How does the UDC plan for long-term deployment of certain technologies?

Could these process be improved with a variety of diverse forecasting summaries? Does the UDC depend on a consensus model for technology deployment or are they provided the freedom to innovate?

See problem 1, 2, 4 and 6 for related information on the need to update and diversify energy industry technology forecasts.

2. How can the UDCs identify the level of future deployment of DER, both on-grid and customer side? What factors would affect the forecasted level of deployment? What mechanism would the UDCs propose to develop the forecast of future DER deployment?

**ANSWER:** This is a key question for energy policy and DG technology evaluation. In Rulemaking 98-12-015, we found it difficult to uncover an actual product basis for many of the deployment decisions being furthered in the June 1, 1999 DG Joint Agency Hearing. Due to the growing diversity of photovoltaic technology, costing comparisons must specify the type of technology the forecast comparisons are referring to.

We found that most of the activities, investments and peripheral organizational interests [like CADER] are focused on fossil fuel gas turbine deployment claiming low cost is the reason for this favoritism. We are greatly concerned because much of the data misrepresents the price of PV DG. Increased deployment of fossil fuels in through gas turbines deployment in DG is not in the best interests of public safety and welfare,

**DISTRIBUTION SYSTEM PLANNING AND OPERATIONS WORKSHOPS  
SOLAR DEVELOPMENT COOPERATIVE  
ANSWER TO QUESTIONS**

---

and does not constitute a competitive energy industry agenda. We found a long-standing policy directed toward the gas turbine goal despite the Renewables Technology Program and other efforts to bring new technologies to the market.

What we discovered were minor efforts like the PIER Program and the Renewables Program to utilize renewables technologies without the basis of a well-articulated plan to facilitate mainstream deployment of renewables technology over a long-term.

In our research we explored several California Energy Commission documents:

- a. Buying a Photovoltaic Solar Electric System: A Consumer Guide August 1999
- b. Natural Gas Market Outlook/Appendices June 1998
- c. 1996 Energy Technology Status Report December 1997
- d. Electricity Report November 1997
- e. Strategic Plan for Implementing the RD & D Provisions of AB 1890
- f. Policy Report on AB 1890 Renewables Funding March 1997
- g. Worldwide Natural Gas: Analysis of Available & Accessible Supplies Dec 1995
- h. Energy and the Economy The California Energy Policy 1994

The Mission and Objectives contained in Chapter II of the Energy Commission's RD&D Strategic Plan are also intended to provide a fundamental framework for the "administration and expenditure" criteria which Legislature adopted in August 1997. 'Strategic and Operational Plans' provide a basis for the 'Public Interest Energy Research' Program [PIER]. The Mission of PIER is to conduct public interest energy research to improve the quality of life for California citizens by providing safe, environmentally sound, reliable and affordable energy services and products. PIER includes a full range of research, development and demonstration activities to advance science or technology not adequately provided by competitive and regulated markets.

**DISTRIBUTION SYSTEM PLANNING AND OPERATIONS WORKSHOPS  
SOLAR DEVELOPMENT COOPERATIVE  
ANSWER TO QUESTIONS**

---

The Objectives of PIER in brief are as follows:

A. Develop a public interest portfolio.

**SDC Response:** Our comment is that deployment is directed toward the special interests of the fossil fuel industry and is not responsive to public interests. This fossil fuel agenda is reflected where California Public Utilities Commission Office of Ratepayer Advocates claims in their Opening Comments for R.98-12-015 that PV photovoltaics is ten times as expensive as gas turbines to install and three times as expensive as gas turbines to maintain. This is not true, and no references were provided to clarify what PV or gas turbine technologies they were referring to. Where the public is to be more involved in deployment decisions, specific costing references to products with explanations of specific products and production level must be included where technologies are compared in price.

We find similar unreferenced slander about the viability of photovoltaics as a DG product by Commission in the *1996 Energy Technology Status Report [ETSR]* where costing evaluations are summarized with no source for how these decisions were reached. Photovoltaics reduced to \$5 watt in 1990 at 0.001% of the electricity consumed by Americans. The products are readily accessible where mainstream deployment is pursued. They are made of refined silica and are less complicated and costly to manufacture than the electronics board on a computer. Yet, on page 52 of this report the graph for Distributed Generation indicates photovoltaics is not commercially available and is not competitive at all due to the show stoppers of *high cost and lack of performance*. Again, the document makes a blanket statement for



**DISTRIBUTION SYSTEM PLANNING AND OPERATIONS WORKSHOPS  
SOLAR DEVELOPMENT COOPERATIVE  
ANSWER TO QUESTIONS**

---

the entire range of PV technology without reference to costing sources. It obviously does not credit the reliable performance of proven PV projects like the historic 300 kWp PV roof installed on the Intercultural Center at Georgetown University in 1984. This project generates an average of one megawatt a day in the heart of the nation's capital without pollution and so aesthetically most people who work in the building don't know the pretty blue roof is generating electricity.

On the other hand, the ETSR Report claims DG reciprocating engines and small-scale turbines are commercially available and competitive in cost. The documents referenced herein suggest throughout that the majority of the California Energy Commission and California Public Utilities Commission goals and activities are entrenched and favored toward developing trade relationships for deployment of fossil fuel gas turbines with little positive information about mainstream deployment benefits and requirements for photovoltaics. They appear mislead by special interests, where they grossly misrepresent not only the affordability of photovoltaics, but also the potential availability of PV and the performance reliability of this important pollution-free product-driven commodity with no externality generating costs as exist for depletable, fuel-driven polluting fossil fuels. The present imbalance of favoritism toward gas turbines needs to be addressed when we evaluate how the UDC will determine what technologies to pursue. The data reveal more than one opinion where analysis of product potential varies. The Department of Energy and the National Renewable Energy Laboratory publish conflicting statements about energy deployment all the time. Two examples are the 1990 NREL booklet entitled



**DISTRIBUTION SYSTEM PLANNING AND OPERATIONS WORKSHOPS  
SOLAR DEVELOPMENT COOPERATIVE  
ANSWER TO QUESTIONS**

---

*Photovoltaics* and the Office of Energy Efficiency's 1992 booklet entitled *Solar 2000*.

The first source forecasts PV at 1000 MWp by the year 2000 and at 50% of the electricity consumed by Americans by 2050. *Solar 2000* indicates a very small role for PV deployment within the next century. These conflicting statements must be acknowledged and incorporated into UDC planning analysis to assure the public interest in PV is supported in infrastructure and deployment planning.

While slander may sound harsh, such extreme misrepresentation on the part of the CEC and the CPUC in negating the proven viability, benefits and known steps needed to realize mass availability and affordable deployment of *building-integrated photovoltaics [BI-PV]* [ie PV-grade silicon] is a serious matter effecting the public health, safety and welfare of the citizens of this state, the nation and the world. The plan to evolve natural gas as a priority is reflected throughout the 1994 California Energy Policy Plan and in opinions presented throughout subsequent reports. It is unethical for California Energy Commissions to pretend PV is too expensive and not commercially available simply because it is not their priority. The agenda is reflected in the graph on page 36 which indicates renewables are predicted to reduce 1% from 2000 to 2010.

SDC provides herein an analysis of California Energy Policy which we believe is the basis for the comments on the cost of PV deployment not PV technology: The Energy Policy Report graph '*Supply and Demand for Electricity*' on page 35 indicates California's energy generation will reduce from 69% of the electricity they consumed in 1992 to 62% in 2011 with an increased demand of 119,939 Gigawatt hours of

**DISTRIBUTION SYSTEM PLANNING AND OPERATIONS WORKSHOPS**  
**SOLAR DEVELOPMENT COOPERATIVE**  
**ANSWER TO QUESTIONS**

---

electricity consumed by Californians. SDC would like to emphasize that Photovoltaics would be an independent energy resource keeping more energy-related jobs in California while reducing dependency on foreign resources. The graph indicates new sources of electricity generation will consist of 11% demand-side management and 9% other supply sources. With the strong focus on gas turbines in DG, this unaccounted for 20% of electricity generation will likely be DG fossil fuel gas turbines bringing the total generation of fossil fuels by California to 84% by 2010.

According to the graph on page 36, coal generated electricity consumption in California increased from 1% in 1970 to 10% by 1990. The graph predicts another 1% increase to 11% by the year 2000 which is predicted to remain constant to the year 2010. As a global leader of innovation, California should respond more strongly to the global fossil fuel phase-out agenda supporting a realistic and responsible renewables pollution reduction plan. While we fully concur California has been a leader in technology development innovation, the subject before us is how and why deployment decisions are made.

*National Rankings of Coal Producing States and Percent of U.S. Total, 1992*  
Appendix A [[http://www.eia.doe.gov/cneaf/coal/st\\_coal\\_pdf/0576hh.pdf](http://www.eia.doe.gov/cneaf/coal/st_coal_pdf/0576hh.pdf)] included herein at Appendix B indicates California ranks the highest in the nation for the quantity of coal production at 26%. The report indicates California coal has the highest Value and Estimated Energy Content being 27% with the number of mines at 21 employing 27 miners the highest number of any other state in the nation. It further indicates California consumes 38% of the coal consumed by all of the states

**DISTRIBUTION SYSTEM PLANNING AND OPERATIONS WORKSHOPS**  
**SOLAR DEVELOPMENT COOPERATIVE**  
**ANSWER TO QUESTIONS**

---

even though they do not have any coal-fired electricity generation while 44 states have such plants across the nation. We assume California may be producing coal for other states and using it in-state for manufacturing. I have not myself seen as much evidence of coal mining and use in California as petroleum refinement plants. These chemical plants cause a lot of pollution in major cities.

The revealing insight of the graph on page 36 indicates Utility Gas provided 46% of the electricity generated in 1970. This has remained fairly constant and is predicted to provide 43% of the electricity generated by California in 2010. Co-generation that generally incorporates gas fossil fuels grew from 1% to 8% in 1990 and is predicted to provide 10% by the year 2010. Fossil fuels provided 64% of the electricity generated by California in 1970 broken down as follows: 17% petroleum, 46% Utility Gas, 0% Gas Cogen, 1% coal. In 1990, fossil fuels provided 61% broken down as 1% petroleum, 42% Utility Gas, 8% CoGen and 10% coal with Nuclear providing 8% and Renewables at 7%. The graph on page 36 predicts very little change by California to cut dependence on fossil fuels over the past thirty years that is predicted to again provide an estimated 64% of electricity generated in California by 2010. The fossil fuel source shifted only slightly over the thirty year span to 43% Utility Gas, 10% CoGen and 11% Coal. With this agenda, it is very difficult to negotiate the needed adjustments toward renewables DG mainstream deployment with either Commission. There was an obvious 1-20 MWp gas turbine DG deployment focus at the June 1, 1999 Joint Agency Hearing. This fossil fuel agenda

**DISTRIBUTION SYSTEM PLANNING AND OPERATIONS WORKSHOPS**  
**SOLAR DEVELOPMENT COOPERATIVE**  
**ANSWER TO QUESTIONS**

---

claiming PV is ten times more expensive than gas turbines while imposing very costly interconnection standards for small PV strongly reinforces the 1994 policy forecast.

The CPUC rejected the official opportunity brought before them in our Opening Comments for R.98-12-015 to investigate the fraud and antitrust activities suppressing *building-integrated photovoltaics [BI-PV]* since Amoco's fraudulent takeover of Solarex Corporation in 1984 just before the Intercultural Center was completed at Georgetown University and Enron/Amoco/BP's subsequent abusive litigation and takeovers of Arco Solar [*Solarex Corporation v Arco Solar, Inc. Ddel, 805 FSupp 252 Fed Civ. Dcennial Digest 1991-1996*], United Solar [remained in business] and Advanced Photovoltaic Systems from 1988 to 1998 using Solarex patents claiming infringement. In two out of three of these cases they put these PV innovators out of business in lieu of agreeing to a settlement. The patents went to foreign ownership by multinational conglomerates in lieu of the small businesses that originally developed or held them. The foreign companies have been allowed to do business with them in the United States. However, in the case of Siemens Solar they have limited production of PV products and have not pursued innovative mainstream deployment projects like Arco Solar did. British Petroleum closed down APS's fully automated manufacturing line in Fairfield, California with their \$20 million dollar takeover May of 1997 following over two years of litigation by Enron/Amoco. The Commission refused to take any of these abuse issues under consideration or even to remand them to another venue despite SDC/Smith's limited resources to do so. These abusive business practices of Amoco, Enron and British Petroleum have

**DISTRIBUTION SYSTEM PLANNING AND OPERATIONS WORKSHOPS  
SOLAR DEVELOPMENT COOPERATIVE  
ANSWER TO QUESTIONS**

---

brutishly kept the price of photovoltaics high and suppressed the needed development of photovoltaic-grade silicon to assure the most economic potential for BI-PV mainstream deployment.

They have refused to advertise their BI-PV products or government incentives to the mainstream market even though they own 70% of the PV modules presently certified for the CEC's 50% buydown program. The Commission, however, remanded Enron's claims of potential unfair competition by UDCs using DG to Phase I of this Rulemaking. Enron claims the UDC will develop another vertical monopoly controlling DG resembling the remote-site monopoly. The UDC would be no less capable of developing a vertical monopoly in a deregulated energy industry than Enron, Amoco or British Petroleum. In fact, they may be less capable simply because they must go through a process of hearings to change their rates and despite deregulation for private industry competition, the Utility remains regulated. That is why we are being allowed to provide public comments to the this Rulemaking process. Amoco, Enron and British Petroleum have not invited public comment to address their management decisions or justify their pricing fixing activities of BI-PV to the CPUC, any other government agency or the public. In fact Enron, Amoco, and BP attempted to place Arco into foreign ownership on April 2, 1999 less than a month after our Opening Comments wherein we officially asked for an investigation regarding the Solarex takeover and litigation against Arco Solar [1988-1991]. Arco is the one company that could lead to prosecution of these three oil cartels for their unfair business practices suppressing BI-PV since 1984.

**DISTRIBUTION SYSTEM PLANNING AND OPERATIONS WORKSHOPS  
SOLAR DEVELOPMENT COOPERATIVE  
ANSWER TO QUESTIONS**

---

The Federal Trade Commission is questioning this merger and discouraging the Arco, Inc. takeover according to an article on the front page of the Business section of the San Francisco Examiner Wednesday, December 1, 1999. The CPUC Commission needs to guide SDC/Smith in assuring appropriate FTC review of industry and consumer concerns about the proposed BP-Amoco takeover of Arco. We believe part of the purpose of the timely takeover less than a month after our formal request to the CPUC for investigation was to suppress documents related to the abusive litigation against Arco Solar from 1988 to 1991. The article expressed FTC concerns about market controls and price fixing of oil industry similar to SDC's concerns about BP-Amoco's [Enron/Amoco] suppression of the photovoltaic industry since 1984.

*'The staff of the Federal Trade Commission has formally recommended the five-member commission reject BP Amoco PLC's proposed \$27 billion purchase of Atlantic Richfield Corp., two sources said Wednesday.*

*The FTC staff is concerned that a combined BP Amoco-Arco would control a huge share of Alaskan crude and lead to higher prices at California gasoline pumps, said the sources familiar with the FTC review.*

*The staff also concluded that the transaction could eliminate Arco as a discount gasoline retailer in California, where prices already are 26 cents a gallon higher than the U.S. average, sources said.*

*Arco, with a 20.4 percent market share, is the leading gasoline retailer in California, where six firms account for more than 90% of sales.*

*The impasse could bring the issue to a head with the FTC asking a federal judge to issue an order blocking the transaction, the people said.*

*When FTC has challenged mergers in the past few years, it has usually been successful.'*

Presently, the Commission is involved with over 300 cases before the Federal Energy Regulatory Commission, and has been involved with numerous cases before the FTC. SDC/Smith's request for assistance to the CPUC regarding the abuse by oil cartels toward her as a small solar energy business and historically holds even more

**DISTRIBUTION SYSTEM PLANNING AND OPERATIONS WORKSHOPS  
SOLAR DEVELOPMENT COOPERATIVE  
ANSWER TO QUESTIONS**

---

weight where the FTC is investigating the potential oil market impact of BP-Amoco's attempted takeover of Arco, Inc. April 2, 1999. Per our interviews with Arco engineers at the 1997 IEEE PV Specialist Conference in Anaheim, we believe that the takeover of Arco less than a month after our formal request for investigation regarding the takeover of Solarex Corp. in 1984 and the abusive litigation shutting Arco Solar down in 1991 stimulates mandatory action by CPUC staff to hold a preliminary investigation and formally remand this case to the FTC for review.

These kind of monopoly imbalances in the competitive playing field will greatly influence the technology portfolio of the Commission and limit potential availability of needed renewables DG technology for mainstream deployment because they effect the availability and quality of products, cost projections and performance criteria for energy technology. The CPUC needs to seriously consider the impact of how they will handle unethical business practices and antitrust activities raised before them in proceedings against UDCs as well as private business in the newly competitive energy industry. A standard plan of action and referral must be in place to avoid the appearance of favoritism. Where such activities directly effect the quality of their reports, CPUC, CEC and EOB would need to responsibly address these issues and remand them to the appropriate venue for full hearing.

In the CEC Energy Policy Report of 1994, the Commission claims the competitive price and favorable environmental attributes of natural gas make it an alternative to petroleum for electricity generation. The idea that they are replacing petroleum deployment with natural gas is short-sighted. If we study the graph on



**DISTRIBUTION SYSTEM PLANNING AND OPERATIONS WORKSHOPS**  
**SOLAR DEVELOPMENT COOPERATIVE**  
**ANSWER TO QUESTIONS**

---

page 36 we find the alternatives replacing petroleum from 17% to a predicted none in 2010 are actually co-generation which increased from none in 1970 with a predicted increase to 10% by 2010 and coal which increased from less than 1% in 1970 to a predicted 11% by 2010. Utility Gas actually is predicted to reduce from 46% in 1970 to 43% by 2010. There are no large-scale predictions for mainstream deployment of renewables technology being furthered in California's deregulation activities and systems planning. In this graph they drop from 7% in 1990 to 6% by 2010 in lieu of increasing. Continued support of limited production with very little public education about renewables incentive programs will result in a similar PV industry backslide that occurred after Germany's '1000 PV Roofs' program. There is a severe lack of long-term vision and facilitation related to mainstream deployment of the dual-use technology benefits of silicon semiconductor photovoltaic products and their readiness for mainstream deployment. In pursuing deployment models for BI-PV we need to look beyond the energy industry and expand our view to deployment of related technologies like silicon in computers and standard building materials.

In discussions with CEC staff this week regarding the imbalance of studies on natural gas and photovoltaics potential for deployment, we were told the Commission staff did not want to duplicate efforts. That is the reason they gave for not developing in-depth reports on BI-PV deployment issues similar to their *Natural Gas Market Outlook* published June 1998. There is no mention in the 1997 Electricity Report or the Energy Technology Status Report that we could find of the *Million Solar Rooftops In USA By 2010 Program* or the National Renewable Energy Laboratory's predicted

**DISTRIBUTION SYSTEM PLANNING AND OPERATIONS WORKSHOPS  
SOLAR DEVELOPMENT COOPERATIVE  
ANSWER TO QUESTIONS**

---

1000 MWp photovoltaics by 2000 with PV deployment forecasts of 50 MWp PV by 2050. CPUC and CEC are obviously focused on fossil fuel deployment in remote-site as well as DG. CADER is a non-profit organization headed run by a natural gas consultant of the CEC. It allegedly equally represents all DG technologies, however I have not seen that they represent renewables technology in the CPUC proceedings. Their membership consists of Utility and Commission employees focused on gas turbine technology and deployment. Thus, renewables DG are not represented by any organization except SDC in the DG proceedings before the Commission. The focus on gas turbine deployment is justified by the alleged competitive price of gas turbines with lower interconnect costs per kWp. Reasonable interconnection costs must be provided to reflect the size of the system. The UDCs must bear the cost of developing system management technology to facilitate small DG economically. Government cannot ethically make choices for consumers indicating a product is '*too expensive*' where it is affordable to deploy. They must provide equal deployment opportunities, studies, public education and service support. While the price of a gas turbine may be a little less than BI-PV, it is up to the consumer to decide what product to purchase. Consumer valuation is more complex than simple *least cost* formulas for many reasons. Consumers have an even greater right to equal access and education about BI-PV products and services where Commission is furthering deployment of large gas turbines with private. CPUC and CEC must provide PV deployment research and deployment support and stop further gas pipeline expansion services. BI-PV is as commercially available as gas turbines.

**DISTRIBUTION SYSTEM PLANNING AND OPERATIONS WORKSHOPS  
SOLAR DEVELOPMENT COOPERATIVE  
ANSWER TO QUESTIONS**

---

It is interesting that the CPUC ORA compares the cost of gas turbines at the projected 100,000 units per year deployment with photovoltaics at its present level of deployment of around 1% in California. Further, well-established businesses will manufacture most of the DG gas turbines. Large businesses like developers, energy service providers and the Utilities will purchase DG gas turbines as consumers. On the other hand the largest market for renewables DG technology like *building-integrated photovoltaics [BI-PV]* is the residential and small to mid-size commercial property owner. To pursue the choice of purchasing twenty-five years of electricity up-front is a new consumer activity requiring significant education and service support to justify. Despite renewables incentive programs, long-term PV deployment investments are discouraged by misrepresenting the price of PV, commercial availability, deployment readiness and the cost of interconnection for small DG.

The Commission priority to support natural gas and the fossil fuel industry erodes the goals of a competitive non-favoritism platform for energy deployment. The public health and safety of California's citizens is being put at risk by allowing stream-line approval with limited consideration of the comprehensive effects of gas turbine deployment or the volatility of fossil fuel availability and related potential increases in cost over the next fifty years.

Shortly following the attempted takeover of Arco, Corp. by BP-Amoco on April 2, 1999 gasoline prices soared in California to nearly 50% more than what they were. With deregulation Commission must strongly retain the public agenda to reduce and

**DISTRIBUTION SYSTEM PLANNING AND OPERATIONS WORKSHOPS  
SOLAR DEVELOPMENT COOPERATIVE  
ANSWER TO QUESTIONS**

---

phase out fossil fuels, and to dismantle the vertical monopolies of oil cartels as well as the UDC for health and safety reasons as well as national security.

The idea that fossil fuel gas turbines will dictate DG in deregulation because they are more cost-effective is a fantasy being furthered with tax-payer dollars through misrepresentation of DG technologies to facilitate stock market gains for a handful of Americans while the health and safety of millions of people suffer from the introduction of more fossil fuel pollution to the California air. This fossil fuel favoritism will be echoed in systems and infrastructure planning of deregulation throughout the nation, and the world if Commission does not retain the renewables technology goals. We raise these issues in this workshop because they will greatly effecting the type and quality of product forecasting for DG deployment over the next twenty years. Japanese PV companies are enjoying over \$5 billion in sales a year.

There is not one word in any of the reports that I could find about the primary hurdle to mainstream deployment of photovoltaics beyond global suppression by oil cartels. The primary deployment issue is not to increase efficiency or even to further attempt to reduce the price of PV because mainstream deployment would reduce the price more quickly and increase efficiency faster than further expensive laboratory research. There is, however, a dramatic need to facilitate mining of silica with a refinement focus on PV-grade silicon. Presently, the PV industry is dependent on extras from computer-grade silicon production. Computer-grade silicon is refined a *billion-to-one* costing \$1,000 unit while Photovoltaic-grade silicon is refined a *million-to-one* costing only \$100 a unit. There is no PV-grade silicon being produced at this

**DISTRIBUTION SYSTEM PLANNING AND OPERATIONS WORKSHOPS  
SOLAR DEVELOPMENT COOPERATIVE  
ANSWER TO QUESTIONS**

---

time. Where the appropriate mining and refinement efforts are put into place, and 30 to 50-year limited warranties are provided, BI-PV will be the least expensive and most benign energy source in the world even at only 1% of the global energy industry.

When people tell me the problem is more complicated, I wonder why they are attempting to complicate and suppress BI-PV deployment. Throughout history, it has often been the simple and most obvious solutions in retrospect that have turned giant industries and billions of dollars of investment toward better technologies.

The present 0.1% grid-connected DG restriction will not greatly hinder gas turbine deployment where UDCs are allowed to generate substantial DG gas turbine electricity. We urge this planning process to adopt our proposed mandatory cap on fossil fuel deployment and our proposed 75% renewables only deployment plan for UDC DG with a 50% requirement for private businesses that own or have owned both technologies. Otherwise renewables technology deployment will be passed over by the CPUC systems and deployment planning in favor of large gas turbines.

See our Matrix of Electricity Generation Deployment at Appendix A.

- B. The second goal of the Strategic Planning objectives of CEC in AB 1890 is to create and maintain public interest RD&D programs that balance risk, timeframes and public benefits in a manner consistent with California energy policies.

With over 80% of the \$540 million of the renewables technology program appropriated to RD&D for remote site deployment, there is an obvious favoritism to large-scale business interests with very little support for residential and small to mid-size commercial DG consumers. Further, the list of green energy providers available

**DISTRIBUTION SYSTEM PLANNING AND OPERATIONS WORKSHOPS**  
**SOLAR DEVELOPMENT COOPERATIVE**  
**ANSWER TO QUESTIONS**

---

at the CEC hotline does not include DG technologies only remote-site businesses.

The \$5 million appropriated for public education of this program went entirely to advertising telling consumers to switch to remote-site green energy providers in lieu of informing them they could generate their own renewable electricity.

In terms of RD&D opportunities for small business. We have been attempting to gain access to and direction for applying for a PIER grant for two years. Everyone sends us to someone else and no one can assist in facilitating a preliminary application. The underlying goal of our inquiry has been to achieve mainstream deployment of BI-PV using the *0-1-10-100-1000 Approach* in deployment of the *Millennium Dome® BI-PV Manufacturing Museum*. Our industry vision combines an array prototype development with streamline manufacturing of two existing PV technologies and a research production line for fully integrated photovoltaic building materials. The entire facility will be designed as a walk-through museum. We initiated a competition of *100 Solar-Voltaic Dome™ Power Stations By 2010* at the World Renewable Energy Congress IV in 1996. This program would provide two of these unique power stations to be built in each state of the United States.

We believe successful completion of this DG deployment program would levelize the price of PV across the market while it increases awareness about and commercial availability of PV products. Commission Energy Technology Status Report claims these are the two *show stopper* hurdles to mainstream deployment of photovoltaics. Our deployment plan would greatly reduce these hurdles. What are we waiting for? Through this program, California would facilitate the prototype project of the Solar-

**DISTRIBUTION SYSTEM PLANNING AND OPERATIONS WORKSHOPS  
SOLAR DEVELOPMENT COOPERATIVE  
ANSWER TO QUESTIONS**

---

Voltaic Dome™ patented by a local World War II veteran to would meet World Bank requirements toward mainstream use in developing nations around the world. The first one is planned for the Living Laboratory Research Park at the University of California at Irvine in the inventor's hometown. While many of the research efforts are medical, we claim to be providing a preventative solution to reduce cancer causing pollutants in the California air that cause a number of immune related diseases including cancer, Parkinsons, respiratory problems, allergies and migraines.

3. How would each of the modes of DG operation (standby, base load, emergency, load following, sale of power) affect distribution planning? To the extent these modes have different planning impacts, how will the UDCs forecast deployment in each mode?

**ANSWER:** Our concern is that the UDC DG planning process is focused on mainstream deployment of large 1-20 MWp gas turbines in lieu of the residential or small to mid-size commercial renewables DG consumers. We noticed in the CPUC ORA's estimates regarding DG deployment that their claims for gas turbine deployment did not reflect the potential volatility of the cost of fossil fuel resources or the present level of BI-PV deployment.

4. How can these forecasts be incorporated into the distribution system planning process?

**ANSWER:** Where the issues and dangers of gas turbine favoritism are recognized and addressed within this Rulemaking, the UDC will be able to serve as a balancing mechanism facilitating mainstream deployment of DG renewables technology where private business refuses or is unable to do so. The UDC would be an ideal partner with small DG renewables businesses attempting to mainstream BI-PV into the marketplace. This type of collaboration would secure the many years of research and tax-payer investments in



**DISTRIBUTION SYSTEM PLANNING AND OPERATIONS WORKSHOPS  
SOLAR DEVELOPMENT COOPERATIVE  
ANSWER TO QUESTIONS**

---

photovoltaic technology within California and the United States. It would assure a leading edge competitive position for California in the DG renewables global market.

Gaps in technology limitations specified in the Energy Technology Status Report could be more easily addressed and alleviated within the larger resource base of UDC deployment of renewables DG. While Enron sees the UDC's use of DG as a potential monopoly controlling DG, we see the UDC as a stabilizing deployment mechanism for renewable DG that have been suppressed by oil cartels for over fifteen years. The UDC has the maturity and stature to greatly reduce the risks and problems with commercial availability and price of PV by dramatically increasing production levels while reducing UDC omissions.

Such efforts would facilitate needed studies like the cost-to-benefit ratio study needed for PV-grade silicon and its potential to reduce the cost of PV across the market. Such a study could be easily and economically facilitated by UDC in cooperation with small businesses that do not have the resources to pursue such a study themselves. With their interests being directed more by public interests versus private oil cartels, they would tend to interpret the data toward realistic deployment analysis for DG renewables.

Other types of research and development efforts could be expanded including the PIER Program where their project focus could evolve through the large commercial potential of the UDC to incubate new renewable DG technologies. PIER presently only allows a project-by-project deployment focus. The UDC would provide the market base to mainstream DG renewables technology. This approach would limit the oil cartel's concern with the UDC developing a vertical monopoly suppressing their DG gas turbines. UDCs

**DISTRIBUTION SYSTEM PLANNING AND OPERATIONS WORKSHOPS  
SOLAR DEVELOPMENT COOPERATIVE  
ANSWER TO QUESTIONS**

---

and the CPUC should limit deployment of fossil fuel gas turbines considering 64% of the electricity generated in California is already fossil fuels. Oil cartels should be required to provide 50% of their DG deployment through renewables technology. California should establish a comprehensive limitation for fossil fuel deployment to under 60% of the electricity generated.

We have suggested in the matrix found at Appendix A that the UDC DG must use 75% renewables technology in their DG deployments due to the need to phase out fossil fuel deployment and the need to facilitate mainstream deployment of renewables technology like building-integrated photovoltaics [BI-PV]. Where large long-established businesses are deploying gas DG and suppressing renewables DG from the mainstream market, the 75% renewables DG requirement for the UDC would balance the needs of the industry with the least conflict and litigation. Where the UDC is actually phasing out of electricity generation entirely, our proposed focus on DG renewables for new infrastructure needs and to assure reliability would solve many problems. It would actually reduce the potential for monopoly abuse by the UDC while they facilitate mainstream deployment of renewables DG technology sooner than would be otherwise possible where oil cartel monopolies have historically suppressed DG renewables. There is a need facilitate commercialization of DG renewables products.

We were concerned to discover fifteen years of SBIR research dollars were spent to develop PV tile shingles, but no efforts or venue to commercialize these products has been provided. The source and location of these technologies are confidential and they are not on the market. We realize there are a variety of irrational forces perpetuating suppression

**DISTRIBUTION SYSTEM PLANNING AND OPERATIONS WORKSHOPS**  
**SOLAR DEVELOPMENT COOPERATIVE**  
**ANSWER TO QUESTIONS**

---

of DG renewables technology. We believe the primary phenomena causing this suppression is industry momentum. While PV is a silicon technology comparable to computer industry, the computer did not have in place a huge competitor with militant global control of the industry. Thus, photovoltaics while it is completely viable and ready for commercial deployment has psycho-political problems to overcome. The best way to overcome these problems is to allow the largest and most regulated environment in the energy industry and enforce mandatory limitations that would facilitate DG renewables deployment. We must expand the economic analysis and forecasts of the industry if we are to succeed. The primary source of suppression of PV deployment is from oil industry takeovers and the strong lobby for a prime position for fossil fuel deployment in the systems planning process for UDCs.

We have also noticed a lack of energy industry integration programs within the Commissions for new businesses and technologies to enter the mainstream markets of the energy industry. What workshops and educational forums that were provided have been quite valuable and helpful, however there is a need for more support and guidance for small business within energy industry business incubators. Most small business incubators do not understand the unique needs of small business in the energy industry.

These interrelated problems could be greatly reduced where diverse forecast models are mandatory considerations in order for Commission staff to face the varying opinions even in government reports related to different technologies and thereby expand their understanding of the potential of different technologies for mainstream deployment within the energy industry. Two different groups with different agendas would write an entirely

DISTRIBUTION SYSTEM PLANNING AND OPERATIONS WORKSHOPS  
SOLAR DEVELOPMENT COOPERATIVE  
ANSWER TO QUESTIONS

---

different Energy Technology Status Report. That is why these reports must be referenced to the products and services they base their evaluations on. Simple opinion is not enough.

***We emphasize that a forecasting model is only a prediction of potential market behavior that can be used to test out numerous potential deployment scenarios. Industry analysis should not be limited to one point of view nor should they ever be considered an end-all static decision-making tool. They can be most efficiently used to predict market behavior of certain technologies as well as the specific deployment needs of certain technology.***

For example a forecast should reveal in its notes that 1-20 MWp gas turbine customers need little consumer education because the consumers are large businesses with the money to educate themselves about new products and related issues. Large long-term investments are part of their daily business activities so 20 to 50-year up-front investments are the norm. Bulk rates will prevail in this category because they are buying in large quantities. The prime benefit of this DG category to society is its function to reduce the number of large remote-site fossil fuel generation stations.

Residential and small to mid-size DG consumers are the largest category of potential individual DG consumers. It is likely that this market will expand rapidly like the computer industry and the UDC must be realistic in assessing and planning for this potential. Residential and small commercial consumers are not normally involved in energy industry decision-making processes and generally expend limited resources toward educating themselves as energy consumers. Many of these consumers are not prepared without in-depth orientation to pay for 25 years of electricity up-front through conventional

DISTRIBUTION SYSTEM PLANNING AND OPERATIONS WORKSHOPS  
SOLAR DEVELOPMENT COOPERATIVE  
ANSWER TO QUESTIONS

---

investment tools. They are not familiar with nor do many of them want to handle the technical issues or sign complex contracts related to grid connection or net metering.

Thus, a well-illustrated owners manual and simple straight forward contracts are needed to make it as simple as owning a phone or a refrigerator. System liability must be easy to insure to further reduce consumer risk. The system must be easy to install, inspect and maintain with system requirements spelled out clearly in an owner's manual. The owner's manual would ideally include a monitoring log to encourage system familiarity and potentially provide important generation data on a DG system.

***Where basic DG system components are encouraged across the market, they can be easily identified and discussed more readily among consumers in deciding which type of system components best meet their needs and their budget. There must be a trouble-shooting division of the CPUC or CEC established to formally handle the unique DG problems for this category of consumers. Design and aesthetic issues are more important to these consumers and they want a quality investment for their hard-earned money with full support for warranty enforcement. Protecting the environment is an important issue to these consumers as well as the independence of creating one's own electricity. The UDC interface is an opportunity to demonstrate the UDC's flexibility and service agenda in deregulation.***

The value of consumer 'interest' for the residential and small to mid-size commercial DG consumers could, if managed appropriately, provide important research data to greatly improve DG renewables technology while immediately assuring commercial availability of BI-PV technology. The consumer market is the most economic research laboratory for any

DISTRIBUTION SYSTEM PLANNING AND OPERATIONS WORKSHOPS  
SOLAR DEVELOPMENT COOPERATIVE  
ANSWER TO QUESTIONS

---

proven product. It has improved millions of products like computer software, fitness equipment, automobiles, etc. The fact that photovoltaics is a ***product-driven investment in lieu of the traditional fuel-driven*** investment has not been adequately considered in the Energy Technology Status Report.

***In summary, product forecasts*** must be evaluated in terms of overall valuation formulas considering [1] potential benefit to the health and safety of society, [2] the benefits of mainstream deployment efforts in terms of research and development of new DG renewables technology with their potential impact on national security and global competitiveness, [3] the management structure that will need to be in place to successfully serve the residential and small to mid-size commercial consumers of DG technologies and [4] the long-term investment benefits of DG renewables beyond the present warranty limitations and the value of consumer '*interest*' where commercial availability is in place.

For example, polycrystalline BI-PV DG presently has a 25-year warranty. We are pushing for 30 to 50-year limited warranties on these products some of which have a predicted 30-50 year life. With the 25-year warranty, industry could offer maintenance package incentives that would clean and inspect a system twice a year and offer extended warranties with proper care in 10 to 15-year intervals after the original warranty is achieved. This could double the life of the investment while substantially decreasing the cost per kWh over the life of the system to half where it provides electricity for 50 years in lieu of only 25 years. Further, consumer investments in BI-PV DG is the much more stable in comparison with fossil fuels that are highly dependent on the volatile global fossil fuel

**DISTRIBUTION SYSTEM PLANNING AND OPERATIONS WORKSHOPS  
SOLAR DEVELOPMENT COOPERATIVE  
ANSWER TO QUESTIONS**

---

market that will become more unpredictable as these resources continue to be depleted and challenged due to war and pollution world-wide.

5. How would widespread deployment of DER affect transmission system planning?

**Answer:** Ten or twenty years ago, the electronics management and monitoring systems available today to the UDC did not exist. This makes it much easier to monitor the safety and quality of each DG system while it provides the opportunity to collect important data that could greatly increase the quality of DG products and services. When considering the effects of DER on transmission system planning, we must simultaneously consider the potential role of the UDC on upgrading and expanding the various technologies and three size categories of the DG industry.

*'Under the recently enacted electricity deregulation, the Commission heads the state's renewable energy and public interest energy research program. Funding over four years for these programs totals \$540 million and nearly 250 million dollars respectively.'*

*The Commission's past research and development programs led to the establishment of new alternative energy industries that contribute \$6 billion annually to California's economy and support 36,000 jobs in the state. In addition, the Commission's Energy Technologies Advancement Program generated \$6 in matching funds for every \$1 invested by the state, which has added approximately \$370 million in state gross product and \$10.3 million in state and local tax revenues.'*



**DISTRIBUTION SYSTEM PLANNING AND OPERATIONS WORKSHOPS  
SOLAR DEVELOPMENT COOPERATIVE  
ANSWER TO QUESTIONS**

---

There needs to be a DG component developed into all new and future transmission system planning to keep up with the potential market penetration of DG technology. Dual metering and related hardware costs of the DG consumer should be reduced through cooperative efforts within transmission system planning. Where there is another allotment for renewables technology made by the State of California it needs to be at least a 50/50 split between DG and remote-site. Eventually, it should only allocate 10% of all renewable energy funding to remote-site generation because DG or self-generation is where renewables technology flourishes and its benefits are most realized thus reducing transmission costs, grid dependency and environmental problems of large remote-site generation and the wires infrastructure.

6. How could the UDCs inform interested parties of the need for DG as an alternate to UDC supplied ancillary services, Var and voltage support, and system upgrade or addition?

**ANSWER:** *Whatever you decide, do not tell the public DG is a viable option in deregulation or about DG technologies that are available. Ha! Staff insists they are waiting to educate the public after the Rulemaking is over and the rules to accommodate DG are in place. Consumer education during the Rulemaking will assure it is more dynamic and addresses a variety of needs not just the oil cartels and the vertical monopoly of the UDC.*

We indicated in our Prehearing Conference Comments for R.99-10-025, consumer education is the most important issues for DG or self-generation technology. We became involved in Rulemaking 98-12-015 because of our concern for the lack of consumer education about their DG choices in deregulation in May 1998. The California energy industry has been deregulated for a year and one-half since I wrote to the CPUC addressing

DISTRIBUTION SYSTEM PLANNING AND OPERATIONS WORKSHOPS  
SOLAR DEVELOPMENT COOPERATIVE  
ANSWER TO QUESTIONS

---

this issue, and still the majority of consumers are not aware of their DG choices. Many Californians have never heard of *photovoltaics* and like the Commission have not heard of the 300 kWp rooftop on the Intercultural Center of Georgetown University. Southern California has twice the number of sun hours as Germany where they installed over 2,000 PV roofs for their *1000 PV Rooftops* program from 1993-1995. This was the first international deployment program for *building-integrated photovoltaics [BI-PV]*.

***The Commission's commitment to address consumer education needs about DG in the final decision was a milestone for DG technology deployment.*** Where consumers are making 20-year up-front investments that are grid-connected with net metering contracts the UDC must be fully involved in educating consumers about DG choices. There must be a centralized effort of consumer education put forth by the CPUC to assure UDC cooperation and support of DG consumers. Due to long-standing suppression of DG technologies through oil cartel monopoly abuse with the lack of facilitation of DG interconnection by the UDC until deregulation despite legislation for net metering in 1995, consumers are very weary of the silence of the CPUC on consumer education about DG. Strong consumer interest will be difficult to transform to mainstream deployment without formal cooperation shown by the CPUC through DG consumer choice education and DG ownership education support.

The UDC could provide a one-page newsletter about DG technologies and services in the monthly ratepayer bills. This would provide a uniform program and reach the greatest number of consumers with the least effort and cost. The UDCs should offer consumer workshops on purchasing, financing and maintaining DG systems. The CEC has provided

**DISTRIBUTION SYSTEM PLANNING AND OPERATIONS WORKSHOPS  
SOLAR DEVELOPMENT COOPERATIVE  
ANSWER TO QUESTIONS**

---

workshops for DG business. Local DG technology vendors could compliment these workshops with product exhibits directed exclusively toward consumers. Where the three categories of DG consumers vary tremendously in the type and requirements of the technology, we would suggest each category of consumer be provided their own workshops to address their unique needs. These free consumer workshops could be paid for in part by CPUC and CEC consumer education resources, energy efficiency funds and/or renewable energy public education resources in partnership with local governments.

The UDCs might also want to sponsor a mini-conference or workshop for investors and community governments interested in furthering DG technology deployment. A fee would be charged to cover the cost of participation in these workshops. Southern California Edison invests in a number of community development activities from baseball to small business development workshops. Where DG is a vital and growing part of their role in the energy industry, the UDC would be a natural source for conducting these workshops.

7. What could be the selection process for having an interested party provide these services?

**ANSWER:** The best selection process would be for the UDC to hire outside consultants to educate their own staff about DG technology and opportunities. Where the consultant does a good job, then they would be hired to conduct the consumer workshops for the UDCs. Public education is one of the most important, costly and time-consuming issues of standing in the way of mainstream deployment of DG. Several reasons include:

- [1] consumer must make a major 25-year investment in their electricity bill up-front,
- [2] consumer needs some technical understanding of equipment to make responsible choices and maintain their systems,

**DISTRIBUTION SYSTEM PLANNING AND OPERATIONS WORKSHOPS  
SOLAR DEVELOPMENT COOPERATIVE  
ANSWER TO QUESTIONS**

---

[3] UDC and consumers need professional intervenors to reduce consumer confusion and time spent by all parties providing long-term support for the consumer, and [4] technical certifications and licenses are needed where applicable.

8. What type of contracts, operational agreements, and dispatch rules would be needed for such services?

**ANSWER:** Contracts should be attractive, simple and straight-forward. The UDC could provide a DG owner's manual unique to specific technology diagrams for interconnection reference with a system monitoring log section for consumers as a public service. This would encourage consumers to keep an eye on their system by logging the amount of PV it makes each day. In checking on the system on a regular basis, they would also document any irregularities they noticed in the way the system is running. Contracts, operational agreements and dispatch rules should be standardized as much as possible. Liability insurance should be readily available and related consumer responsibility should be realistic and not overly burden a residential or small commercial consumer with liabilities. The systems should be covered by homeowners or renter liability insurance. Where the system is to be installed on a structure that is owned by someone else, special provisions should be established for these DG consumers with property owner approvals.

Respectfully submitted this 6<sup>TH</sup> day of December, 1999.

---

Eileen M. Smith, M.Arch.  
Founder & CEO Since 1992  
SOLAR DEVELOPMENT COOPERATIVE  
3535 East Coast Highway  
Corona del Mar, CA 92625

# APPENDIX

## A

### MATRIX

#### **Electricity Generation In Deregulation 1999**

*[Page Six Motion to Compel Discovery R.98-12-015]*

## B

#### **National Rankings of Coal Producing States and Percent of U.S. Total, 1992**

**Energy Information Administration  
State Coal Profiles**

**DISTRIBUTION SYSTEM PLANNING AND OPERATIONS WORKSHOPS  
SOLAR DEVELOPMENT COOPERATIVE  
ANSWER TO QUESTIONS**

---

**CERTIFICATE OF SERVICE**

On or before this 6<sup>th</sup> day of December, 1999 I certify that I have filed the Distribution System Planning and Operations Workshop with the California Public Utilities Commission at: [r9812015@cpuc.ca.gov](mailto:r9812015@cpuc.ca.gov) for posting on the Internet as is required by Commission and to the Respondents of R.98-12-015 by electronic mail as is verified in the attached list herein. We have docketed these Comments with the California Energy Commission Docket Office in Sacramento by hand-delivering twelve copies to the California Energy Commission Docket Office on December 6, 1999. We have officially filed the Distribution Planning and Operations Workshop Solar Development Cooperative Answer To Questions by hand-delivery of five copies to the California Public Utilities Commission Docket Office on or before December 7, 1999.

---

Eileen M. Smith, M.Arch.  
Founder & CEO Since 1992  
SOLAR DEVELOPMENT COOPERATIVE  
3535 East Coast Highway  
Corona del Mar, CA 92625

949-862-5826 Extension 1  
<http://www.geocities.com/Eureka/1905>  
[SolarDevelopmentCooperative@go.com](mailto:SolarDevelopmentCooperative@go.com)



**5 Kilowatt Peak Rooftop University of California at Irvine  
National Fuel Cell Research Center**